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(54) **SINGLE CELL ANALYSIS USING SECONDARY ION MASS SPECTROMETRY**

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(57) **ABSTRACT**

A method of analyzing a population of cells is disclosed. In certain embodiments, the method includes i) obtaining an array of cells on a substrate, wherein the cells are labeled with one or more mass tags and are separated from one another, ii) measuring, using secondary ion mass spectrometry (SIMS), the abundance of the one or more mass tags at a plurality of locations occupied by the cells, thereby generating, for each individual cell measured, a set of data, and iii) outputting the set of data for each of the cells analyzed. Also provided herein are systems that find use in performing the subject method. In some embodiments, the system is an automated system for analyzing a population of cells using SIMS.